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Technology Opportunity

Technology Transfer & Partnership Office

TOP3-00187

Liquid Crystal Optical Beam Steering and Wavefront Control Device

Technology

The National Aeronautics and Space Administration (NASA) seeks to transfer technology for the development of applications of an Optical Beam Steering Device based on liquid crystal technology.

NASA has developed the design capability for devices that can steer light and correct wavefront distortions with high accuracy.

This capability has been demonstrated using control electronics and Liquid Crystal On Silicon (LCOS) devices funded by DARPA's THOR program and built by Kent State University with HANA Microdisplay Technology, Inc. components.



Figure 1.—Liquid Crystal on Silicon (LCOS) device with 789,000 individually addressable phase-shifting elements (HANA Microdisplay Technology, Inc.)

Benefits

- Designed for operation at 1.5 microns
- Provides electronic (nonmechanical) beam steering
- Steering range is approximately milliradians
- Beam pointing accuracy is approximately submicroradian
- Wavefront correction capability using commercial, off-the-shelf components
- Low weight, low cost, and low power consumption

Commercial Applications

- Directed optical communications for terrestrial applications
- Precision tracking
- Correction of aberrations in lightweight optical elements.

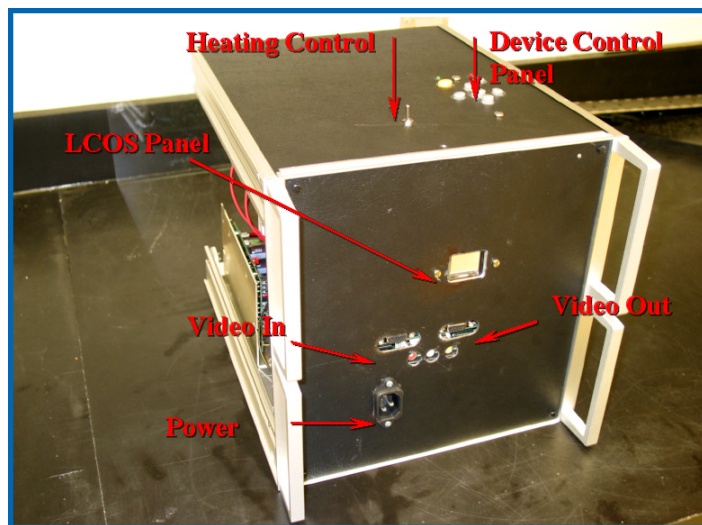


Figure 2.—Control electronics for liquid crystal beam steering device. (Demo device funded by DARPA through Wright Patterson Air Force Base and built by Kent State University.)

Technology Description

The liquid-crystal-based beam steering device enables the incoming laser beam to be steered electronically through a range that is in the order of milliradians. It offers precise beam pointing to the submicroradian level. It has further been demonstrated to be capable of removing 10's of waves of distortion from the primary optical element of large telescopes. The non-mechanical device is small in size, is low weight, and consumes little power.

Options for Commercialization

The NASA Glenn Research Center is seeking partners in industry and academia to continue developing this concept and pursuing a commercialization plan for applications of this technology. If you are interested to learn more about this technology, please contact us.

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Key Words

Liquid crystal

Beam steering

Wavefront correction